Apparatus and method for making fibre balls

The present invention concerns an apparatus for making fibre balls from a fibrous product, where the apparatus includes an inlet for fibrous products and an outlet for fibrous balls, where the apparatus includes a cylindric housing, where the apparatus includes a centrally disposed, through-going rotating shaft that is driven by a motor, where a number of radially outwards directed wings are secured to the shaft and are interacting with the internal wall of the cylindric housing, where the cylindric housing on the inner wall includes at least one axially extending projection, where the projection of the inner wall interacts with the front edge of the outwards projecting wings, where the axially extending projection is designed with radially and inwards directed teeth, and where the front edges of the outwards directed wings are designed with radially, outwards directed teeth.

From US 5,429,783 there is known an apparatus for making fibre balls from a fibre-containing material, the apparatus including a vertical, upright cylinder that contain a through-going shaft on which is secured a number of horizontal wings, where the wings are finished by axially oriented plates that across a spacing interact with the inner wall of the cylinder. The spacing between the axially oriented plates and the inner wall of the cylinder is fixed. Close to the top of the cylinder there is an air fan ensuring an air flow and thereby transport of fibres and fibre balls up through the cylinder.

US 4,618,531, US 4,783,364 and US 4,794,038 also describe apparatuses for making fibre balls that consist of a cylinder containing a rotating shaft to which a number of arms are fastened. The machine is batch producing, and during operation is used an external blower for closed circulation of fibre products through the machine until a batch is finished.

US 4,144,294 describes a machine for forming fibre balls consisting of a box that inside contains a half barrel-shaped, lower section, where inside the box and the barrel-shaped lower section a mill system is running, consisting of 4 wings, where combs are provided on the wing tips. These combs interact with distributed combs disposed inte-

provided on the wing tips. These combs interact with distributed combs disposed interiorly of the cylinder part, where between the movable combs and the fixed combs a close passage occurs, as the teeth of the combs project in between each other. Fibre balls are thus formed by the through-going passage.

However, it is a relatively slowly producing machine as the box can only be filled with fibres desired to be transformed into fibre balls through a small opening. Thus there are not shown particular apertures for neither intake of fibre material or output of finished fibre balls. The machine described hereinabove may nearly be termed a traditional, known carding machine. In a machine like this there is not seen anything like means generating air transport through the machine.

The purpose of the invention is to provide a simple and rapid, continually working machine for producing fibre balls from a fibre product. This may be achieved with a machine like the one described in the introduction, where at least one of the radially outwards directed wings is angularly displaced relative to the longitudinal axis of the wings for achieving an air flow through the apparatus.

Hereby may be achieved that fibre balls are formed in a very efficient way. Fibre products may continually be supplied to the inlet, and finished fibre balls may continually be delivered from the outlet of the machine. The machine is not critical with regard to the form of the fibre products supplied to it. Loose fibres may be used, but plates or lumps of cohering fibres may be supplied, as the machine is automatically performing division into smaller lumps of fibres. The passage of the wings by the projections contributes to dividing larger lumps of fibres into lesser cohering lumps of fibres that may be transformed to fibre balls.

The axially extending projections may be designed with radially, inwards directed teeth. Hereby, adhering of fibres to the edges of the teeth may be achieved, whereby transport through the machine is delayed, and further working of the fibre balls is effected.

The front edges of the outwards directed wings may be designed with radially outwards directed teeth. Hereby may be achieved that the front edges of the wings have a number of edges contributing to a rotating movement of the fibres.

At least one of the outwards directed wings may advantageously be angularly displaced for achieving an air flow through the apparatus. Hereby may be achieved that the apparatus itself includes means for transporting fibres through the machine. At the same time, there may arise a rotating, advancing turbulent air flow through the machine, where the inwards directed projections further contribute to the forming of turbulence in the through-flowing air. The turbulent flow may contribute to the shaping of the fibre balls in that the turbulent flow may imply frequent contact between fibre balls and cylinder inner wall, the projections of the inner wall, and the rotating wings.

The edges of the outwards directed wings may be angularly displaced, whereby the radially outwards directed teeth may interact with a plurality of the radially, inwards directed teeth of the projections. Hereby may be achieved that the fibres are effectively loosened from both the inwards directed teeth of the projections and of the teeth of the wing front edges. Thus the capacity of the machine may be increased.

The outwards directed wings may advantageously be angularly displaced with different angles. Hereby may be achieved that the air flow through the machine becomes different, whereby further turbulence in the machine may be attained. By increasing he air speed from inlet to outlet, overfilling of the machine may be prevented as the transport capacity forward through the machine may be increased.

The inner wall of the cylindric housing may contain a number of axially extending projections that may be disposed with angular intervals on the cylindric inner wall. Hereby may be achieved that the rotating flow of air and fibres becomes further turbulent, and the capacity of the machine and the quality of the produced fibre balls are increased.

The invention may include a method for making fibre balls from a fibrous product in a

machine that include a cylinder containing a number of wings secured to a rotating shaft that is driven by a motor, where the inner wall of the cylinder includes radially inwards directed projections for forming a turbulent flow of fibres and air, where the front edges of the wings are compressing the fibres by close contact with the projections of the cylinder, where the compressed fibres form fibre balls by repeated contact with the rotating wings and the inner wall of the cylinder.

By the method may thus be achieved that a fibre material is rapidly and in a simple way transformed into fibre balls by a continuous process.

In the following, the invention is explained from Fig. 1 that shows a possible embodiment of an apparatus 2 for making fibre balls. The apparatus 2 includes an inlet 4 and an outlet 6. A cylindric housing 8 includes a rotating shaft 10 driven by a not shown motor. A number of wings 12 are symmetrically secured to the rotating shaft 10. The cylindric housing 8 has an inner wall 14 including projections 16 that interact with wing front edges 18. The projections 16 are designed with teeth 20 interacting with the wing front edges 18 that are designed with teeth 22.

Fibres, in the shape of loose fibres or crudely cut blocks of fibres, are supplied to the machine inlet 4. The machine sucks the fibres onwards to contact with the first set of wings 12 that divide the fibre blocks into lesser lumps. Fibres passing between wing front edges 18 and projections 16 are compressed and jerked loose from the teeth 20, 22 found on both projections 16 and wing front edges 18. At the continued passage of the rotating wings 12, compression and jerking loose of the fibre balls are repeated. The rotating wings 12 induce a rotating as well as advancing air flow in the cylindric housing. The air flow moves the fibres, and the rotating movement of the air will produce rotation of loose fibres and entirely or semi-finished fibre balls. Centrifugal forces will deflect fibres and fibre balls outwards against the inner wall 14 of the cylinder, where the projections 16 are forming turbulence. The turbulent movement of the fibre balls contributes to their shaping. By combination of contact between still and rotating teeth and the turbulent movement is achieved a very rapid and efficient formation of fibre balls.